

level corresponding to the assigned summer freeboard.

[CGD 74–32, 40 FR 48283, Oct. 14, 1975, as amended by CGD 74–32, 40 FR 49328, Oct. 22, 1975; CGD 90–051, 57 FR 36245, Aug. 12, 1992; USCG–2008–0179, 73 FR 35015, June 19, 2008; USCG–2010–0351, 75 FR 36286, June 25, 2010]

APPENDIX B TO PART 157—SUBDIVISION AND STABILITY ASSUMPTIONS

1. *Source.* The procedures for the loading assumption calculations contained in this Appendix conform to Regulation 28 of Annex I of the International Convention for the Prevention of the Pollution from Ships, 1973, done at London, November 2, 1973.

2. *Loading Assumptions.* For the purpose of calculating subdivision and damage stability for a tank vessel, the operating drafts must reflect actual partial or full load conditions consistent with trim and strength of the vessel. Ballast conditions need not be considered if the tank vessel is not carrying oil in cargo tanks excluding oily residues. Loading condition must reflect the specific gravities of the cargo.

3. *Damage Assumptions.*

(a) Damage is applied to all conceivable locations along the length of the vessel as follows:

(1) For a vessel of more than 225 meters in length, anywhere in the vessel's length.

(2) For a vessel of more than 150 meters, but not exceeding 225 meters in length, anywhere in the vessel's length except where the after or forward bulkhead bounding a machinery space located aft is involved in the damage assumption. The machinery space is calculated as a single floodable compartment.

(3) For a vessel 150 meters or less in length, anywhere in the vessel's length between adjacent transverse bulkheads except the machinery space.

(b) The extent and the character of the assumed side or bottom damage, as defined in section 2 of Appendix A of this part, must be applied except longitudinal bottom damage within 0.3L from the forward perpendicular must be assumed to be the same as that for side damage. If any damage of lesser extent results in a more severe condition, such damage must be assumed.

(c) If damage involves transverse bulkheads as specified in paragraphs (a)(1) and (2) of this section, transverse watertight bulkheads must be spaced at least at a distance equal to the longitudinal extent of the assumed damage specified in paragraph (b) of this section in order to be considered effective. Where transverse bulkheads are spaced at a lesser distance, one or more of these bulkheads within such extent of damage must be assumed as nonexistent for the purpose of determining flooded compartments.

(d) If the damages between adjacent transverse watertight bulkheads is within the definition contained in paragraph (a)(3) of this section, no main transverse bulkhead or a transverse bulkhead bounding side tanks or double bottom tanks is to be assumed damaged, unless:

(1) the spacing of the adjacent bulkheads is less than the longitudinal extent of assumed damage defined in paragraph (b) of this section; or

(2) there is a step or a recess in a transverse bulkhead of more than 3.05 meters in length, located within the extent of penetrations of assumed damage. The step formed by the after peak bulkhead and after peak tank top is not regarded as a step for these calculations.

(e) If pipes, ducts, or tunnels are situated within the assumed extent of damage, there must be arrangements so that progressive flooding may not thereby extend to compartments other than those assumed to be floodable for each case of damage.

(f) For oil tankers of 20,000 DWT and above, the damage assumptions must be supplemented by the following assumed bottom raking damage:

(1) Longitudinal extent:

(i) For ships of 75,000 DWT and above, 0.6L measured from the forward perpendicular.

(ii) For ships of less than 75,000 DWT, 0.4L measured from the forward perpendicular.

(2) Transverse extent: B/3 anywhere in the bottom.

(3) Vertical extent: Breach of the outer hull.

4. *Characteristic and Condition Assumption for Calculations.*

(a) Account must be taken of any empty or partially filled tanks, the specific gravity of cargoes carried, and any outflow of liquids from damaged compartments.

(b) The permeabilities are assumed as follows:

Intended space use	Permeability
Stores	0.60
Accommodation	0.95
Machinery	0.85
VOIDS	0.95
Consumable liquids	¹ 0 or 0.95
Other liquids	² 10 or 0.95

¹ Whichever results in the more severe requirements.

² The permeability of partially filled compartments must be consistent with actual density and the amount of liquid carried.

(c) The buoyancy of any superstructure directly above the side damage is to be disregarded. The unflooded parts of superstructures beyond the extent of damage may be taken into consideration if they are separated from the damaged space by watertight bulkheads and no progressive flooding of these intact spaces takes place. Class I doors are allowed in watertight bulkheads in the superstructure.

(d) The free surface effect is to be calculated:

(1) at an angle of heel of 5 degrees for each individual compartment; or

(2) by assessing the shift of liquids by moment of transference calculations.

(e) In calculating the effect of free surfaces of consumable liquids, it is to be assumed that, for each type of liquid, at least one transverse pair or a single centerline tank has a free surface and the tank or combination of tanks to be taken into account is to be those where the effect of free surface is the greatest.

[CGD 74-32, 40 FR 48283, Oct. 14, 1975, as amended by USCG-2000-7641, 66 FR 55573, Nov. 2, 2001; USCG-2008-0179, 73 FR 35015, June 19, 2008]

APPENDIX C TO PART 157—PROCEDURE FOR DETERMINING DISTRIBUTION OF SEGREGATED BALLAST TANKS TO PROVIDE PROTECTION AGAINST OIL OUTFLOW IN THE EVENT OF GROUNDING, RAMMING, OR COLLISION

1. *Source.* The procedure for determining the distribution of segregated ballast tanks contained in this appendix conforms to Regulation 18, paragraphs 12-15 of the MARPOL Protocol.

2. *Procedure.* Protective location of segregated ballast tanks, voids, and other spaces that do not carry cargo which are within the cargo tank length is determined from the following:

$$\Sigma PA_c + \Sigma PA_s = J[L_t(B + 2D)]$$

Where:

PA_c =the side shell area in square meters based on projected molded dimensions for each segregated ballast tank, void, or other space that does not carry cargo and which complies with paragraph 2(b) of this appendix;

PA_s =the bottom shell area in square meters based on projected molded dimensions for each segregated ballast tank, void, or other space that does not carry cargo and which complies with paragraph 2(b) of this appendix;

L_t =the length in meters between the forward and after extremities of the cargo tanks;

B =the maximum breadth of the ship in meters measured amidship to the molded line of the frame; and

D =the molded depth in meters measured vertically from the top of the keel plate to the top of the freeboard deck beam at the side amidships. In tank vessels having rounded gunwales, the molded depth is measured from the top of the keel plate to the point of intersection of the molded lines of the deck and side shell plating, the lines being extended as though the gunwale were of angular design.

(a) *Method of determining a value for J.*

(1) For tank vessels for 20,000 DWT, $J=0.45$.

(2) For tank vessels of 200,000 DWT or more:

(i) $J=0.30$; or

(ii) J =the greater of 0.20, or

$$0.30 - \left[a - \frac{(O_c + O_s)}{40 A} \right],$$

where:

$a=0.25$ for tank vessels of 200,000 DWT.

$a=0.40$ for tank vessels of 300,000 DWT.

$a=0.50$ for tank vessels of 420,000 DWT.

For values of DWT between 200,000 and 300,000 DWT, 300,000 and 420,000 DWT, and greater than 420,000 DWT, the value of "a" is determined by linear interpolation.

O_c = as calculated in Appendix A of this part.

O_s = as calculated in Appendix A of this part.

O_A = the allowable oil outflow meeting §157.19(b)(1) of this part.

(3) For values of DWT between 20,000 and 200,000 DWT, the value of "J" is determined by linear interpolation between 0.45 and 0.30 respectively.

(b) PA_c and PA_s : *Criteria for determining the segregated ballast tanks, voids, and other spaces that do not carry cargo.*

The following criteria are to be met for a segregated ballast tank, void, or space that does not carry cargo, to be used in determining PA_c and PA_s :

(1) The minimum width of each wing tank or space, either of which extends for the full depth of the vessel's side or from the main deck to the top of the double bottoms is 2 meters or more. The width is measured inboard from the vessel's side shell plating at right angles to the vessel's center line. If a wing tank or space has a width anywhere within it that is less than 2 meters, that wing tank or space is not used when calculating PA_c .

(2) The minimum vertical depth of each double bottom tank or space is $B/15$ or 2 meters, whichever is smaller. If a double bottom tank or space has a depth less than $B/15$ or 2 meters, whichever is smaller, anywhere within it, the double bottom or space is not to be used when calculating PA_s .

(3) The minimum width of a wing tank or space is not measured in the way of—

(i) the turn of the bilge area; or

(ii) a rounded gunwale area.

(4) The minimum depth of a double bottom tank or space is not measured in the way of the turn of the bilge area.

[CGD 77-058b, 45 FR 43716, June 30, 1980, as amended by USCG-2008-0179, 73 FR 35015, June 19, 2008]